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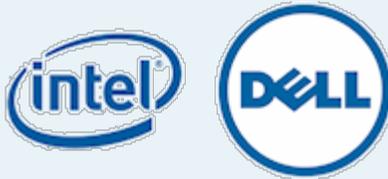


TechInsider

Maximize your productivity with professional workstations

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Hardware 101: Get To Know Your Workstation

Keep Track of These Top Workstation Components

By Alex Herrera

Editor's note: Through a sponsorship by Dell and Intel®, Cadalyst editors bring you this feature, part of a special series of articles designed to educate CAD users and managers about the benefits and realities of professional workstations. Find even more information at the [CADspeed blog](#).

Getting familiar with your workstation doesn't have to be an intimidating process. While the technology hidden under the hood of today's workstations is amazingly complex, understanding the function of your machine's key components needn't be. A basic understanding your hardware is worthwhile to have, not only the next time you go shop for a new machine or graphics card, but in tuning your day-to-day workflow as well.

Keep It Simple

Keeping it simple is almost always a good thing. Details can be helpful, but not if you get lost in them. Big picture, your workstation breaks down into seven basic components, including CPUs, GPUs, memory, storage, displays, and I/O. Wait, you say, that's only six. Well, unlike the six components you can see and touch, the seventh isn't tangible, yet it's arguably the most valuable: ISV certification. For entry-class workstations, hardware certification by the ISV (Independent Software Vendor) is the best differentiator between a workstation and general-purpose PC.

ISV certification, [explored in more detail below](#), means your hardware has been exhaustively tested, not only by your workstation vendor, but by the provider of the software you rely on most to get your job done. Certification means piece of mind — knowing you've virtually eliminated any problems that might arise from lack of compatibility or interoperability. Those problems that might otherwise wreak havoc on your projects and timelines have been taken care of. If you're running applications such as AutoCAD or SolidWorks for big chunks of your day, you're going to want to know they've been proven to work fast and reliably with your hardware.

Think of the remaining six components as the pieces that a) process data, b) view data, c) store and retrieve data, and d) communicate results, data, and control.

Process

The bulk of the computational power in today's workstations is built into two units: the CPU (central processing unit) and the GPU (graphics processing unit). Think of the CPU as your system's indispensable, versatile, do-it-all processor. It handles all processing for

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the operating system (e.g., Windows), most input/output, and the bulk of application processing. Today's CPUs stress *multi-core architectures*, where the processor not only performs one task faster than its predecessors, but it can handle more tasks in parallel.

More than most any other computing platform, workstations are built to visualize. 3D graphics, fundamental in professional workflows from Detroit automotive design to Hollywood studios, requires computation that is highly demanding and specialized. It's the one key computing task that justifies another high performance processor in your system: the GPU. The GPU takes your model and a viewpoint, and renders that image up to 60 times a second for applications such as real-time architectural walkthroughs.

One detail worth noting is that increasingly, the GPU need not be a physically separate graphics chip or add-in card, as CPU leader Intel now integrates a GPU into select Intel® Xeon® and Intel® Core™ processors. For example, the company has released the P4000, ISV-certified for use in workstations running popular CAD applications.

View

That leads us to another key component of your hardware setup: the display, or more increasingly, your multiple displays. Your GPU is not only tasked with creating every image, it's also responsible for painting those images on one to several displays. The secret is out that the single most effective way to bump up your CAD productivity is to use two or more monitors. Typical cost effective monitors today use LCD technology with an LED backlight, run 23" inches or so diagonally, and support FullHD resolution, the 1,920 x 1,080 pixels equivalent to HD television.

Store and Retrieve

OK, so we can process data, both for general purposes as well as graphics content. But, where does the data live? In two places: your storage and memory subsystems. Storage, typically comprised of hard disk drives (HDDs) contains all your data, but your processors access it slowly. Memory, composed of some type of RAM (random access memory, such as DDR3), contains a subset of your data (along with processors' internal caches), but your processors access it more quickly. Bigger and faster are great qualities for both storage and memory, but workstation-caliber platforms carefully combine the two to balance performance and capacity.



Dell's family of new workstations, featuring Intel® technology, provide front-side ports for a user-friendly access and connectivity.

Communicate

Finally, all the processing and data is useless if we can't feed data, retrieve results, or control the system. That's where your input/output (I/O) functionality comes in. I/O isn't contained in one single physical component, but encapsulates a range of connectors and interfaces. Fortunately, that range for many is shrinking. Increasingly, most of a system's I/O is funneled through three paths: the display, the network, and the Universal Serial Bus (USB).

Your network connection, such as Ethernet, connects you not only to the Internet, but also any devices you might have in your LAN (local area network), such as printers, back-up storage, and other computers. USB has been crucial in simplifying workstation and PC connectivity. Keyboards, mice, external storage, cameras, and camcorders — really the majority of devices a CAD pro deals with is adequately served by USB.

Unfortunately, the complete I/O landscape isn't quite as simple as we'd all like. Display connectors remain a potential source of confusion, both because of the multiple connectors for those multiple displays, but also because the industry is currently in a state of transition. Fading out is the long-time, legacy VGA connector. Also fading is DVI, which ironically, was supposed to be the thing that replaced VGA, but didn't quite make it. In their place is emerging a combination of DisplayPort and/or HDMI, the latter of which is now commonplace in consumer electronics. Analog audio mini-jacks remain, both for speakers and microphones, augmented by options for audio support over USB or the aforementioned DisplayPort and HDMI (both of which carry audio as well as video).

The Wide-Angle View

Today's workstation contains billions of transistors. It stores trillions of bytes of data and can execute trillions of calculations per second — literally. The silicon technology making it all work is incredibly complex, but CAD professionals generally don't need to stick their heads under the hood. Keep in mind the basics and you'll be better at detecting bottlenecks in your current setup. And, you'll be better equipped to outfit that perfect configuration in your next workstation shopping trip.

With more than 25 years of engineering, marketing, and management experience in the semiconductor industry, Alex Herrera is a consultant focusing on high-performance graphics and workstations. Author of frequent articles covering both the business and technology of graphics, he is also responsible for the Workstation Report series, published by Jon Peddie Research.



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What's All The Fuss?

How and Why Do Hardware Companies Get ISV Certification?

By Alex Herrera

We've all heard that we should buy workstations and not off-the-shelf PCs for CAD and it makes sense.

Lucky for our wallets, entry-level workstations share much of the same base technology as PCs. The platform's pace of innovation and manufacturing economy-of-scale has enabled workstation vendors like Dell to deliver workstation benefits, without the exorbitant price premiums of those old proprietary machines from the 1980's and 90's. Entry-level machines like the Precision T1650 can now be had at starting prices as low as \$599. Midrange machines, such as the T3600 below, start at \$799 and high-end workstations start at \$1,399.

A workstation doesn't have to be

expensive, and yet even the most "entry" of entry-level workstations offer one important feature that a PC can never — and will never — have: ISV (Independent Software Vendor) certification. What's ISV certification? Simply put, it's a level of quality that says the software vendor that supplies your critical CAD software has tested your workstation thoroughly and vouches for its reliability running that software.

Under the Hood

How does a workstation achieve that certification? The answer's simple: testing, and lots of it. The workstation OEM (Dell, for one) and the ISV (companies like Autodesk and Dassault Systèmes) team up to put new system configurations through exhaustive testing, at both system and board (e.g. graphics card) level.



The Dell Precision T3600 tower workstation featuring Intel® Xeon® processors.

The certification team runs a regression test suite on each new workstation configuration — hardware and software — and if the results match previous known, good results, then that new configuration is deemed to be reliable and receives certification. If an error is detected, the bug is isolated, fixes are introduced, and regression tests are re-run. The cycle continues until the entire regression test suite passes.

Comprehensive regression testing ensures a new workstation runs the same programs every other certified workstation before it did, accurately and reliably ... *before* it ever gets out on the store shelves.

The Whole Package

With certification, the ISV blesses the whole workstation package: hardware, applications, and drivers. This lets your IT department know, for example, exactly which driver to use in a workstation that's going to run your modeler, your simulator, or your entire workflow. With every Dell workstation certified to run AutoCAD, SolidWorks, Catia, Creo, and a host of other popular CAD packages, the guesswork in pairing up drivers, operating system versions, application versions, and graphics cards is gone. You've got instant peace of mind, knowing you're running the same combination of hardware and software that your ISV has run in its labs ... and one that the ISV stands behind.

Think about what you really need out of your IT. Yes, performance is critical, but performance without reliability *is* worthless. Your schedule, your deliverables all depend on cranking through your compute workflow in the time you expect. You can't afford downtime, not even a few minutes to reboot, let alone a day or longer after discovering that bargain PC you stumbled upon doesn't want to play nice with your modeling package.

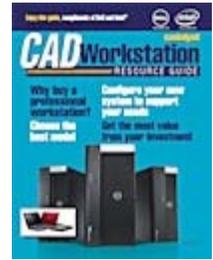
How much is your time worth? How much will it cost you if you miss a client's deadline? With today's economically priced, ISV-certified workstations, there's no need to find out. — A. H.

What's New at Cadalyst.com

[Learn More: Cadalyst's CAD Workstation Resource Guide](#)

Is it time for a new CAD workstation? Search this list of online

resources to find information and advice about configuring a professional workstation to meet your CAD needs and make the best purchasing decision. We've brought together information from Cadalyst, Dell, and Intel to make it easy for you to find what you need to know. Plus, sign up for the updated print version of our CAD Workstation Resource Guide. [Read more](#) »



CADspeed Blog Post:

[Recommended Hardware for CAD, Part 1: AutoCAD, Inventor, Revit and Other Autodesk Applications](#)

Here at CADspeed, we get a lot of questions about buying new hardware for CAD applications. While the answer to, "What CAD hardware should I buy?" varies widely based on the person asking the question, it always starts in the same place: with the requirements of the CAD software you plan to use. [Read more](#) »

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